

State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME
1416 Ninth Street
Sacramento, California 95814

Inland Fisheries - Informational Leaflet No. 44

SURVEY PROTOCOL FOR
CALIFORNIA TIGER SALAMANDER (*Ambystoma californiense*)^{1,2,3}

INTRODUCTION

The California tiger salamander (CTS) is a California Department of Fish and Game (DFG) Species of Special Concern and a United States Fish and Wildlife Service (FWS) Candidate Species. Following review of a petition to list the species as federally Endangered (Long 1992), the FWS ruled that Threatened or Endangered status was "warranted but precluded" (Sorenson 1994). Current law states that the FWS must therefore evaluate the species' status annually and publish a ruling.

For purposes of environmental review of projects, the DFG considers the CTS to be a Threatened species under Section 15380(d) of the California Environmental Quality Act (CEQA). Refer to Jennings and Hayes (1994) for justification of the recommended "Threatened" status.

This protocol was developed to ensure that an adequate level of background examination and field work is conducted to determine the occurrence of the CTS on a specific site and to ensure an appropriate level of sensitivity when working with this animal. Also, by standardizing the survey effort and reporting information directly to existing agency databases, trends of salamander numbers at various locations can be monitored range-wide following baseline data provided by Shaffer et al. (1993) and others.

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 2. Primary contributors were Mark L. Allaback, David M. Laabs, Richard B. Seymour, and Michael F. Westphal. Primary reviewers were Caitlin Bean and Mark R. Jennings.
 3. This Protocol may be revised in the future as more information becomes available.

PROCEDURES

A site analysis shall be completed for each project. A habitat assessment shall be completed for each project within the range of CTS. Biological surveys shall be conducted until CTS are found or the criteria for a Negative Finding are met.

Site Analysis

The first task is to determine if the project site is within the historic range of CTS as provided by Jennings and Hayes (1994), Shaffer et al. (1993), and Stebbins (1985). If the parcel is no more than 1 km (0.62 mile) outside the recognized limit of the historic range of the species, it shall be considered to be within the range. The closest known breeding locality should be determined. A review of the DFG Natural Diversity Data Base and request for information on localities from the Endangered Species Office of the FWS are essential. Communications from both agencies must be documented. If the parcel is found to be more than 1 km (0.62 mile) outside the range of the species, the site analysis should include information in support of this determination.

Habitat Assessment

The CTS is most commonly associated with grasslands in rolling terrain or foothills that contain suitable underground retreats such as burrows of the California ground squirrel (*Spermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*). CTS have been found, however, in areas with no apparent underground retreats (M. Allaback, W.Cox, G. Monk, pers. comm.) In these areas CTS may utilize cracks in the ground or may burrow into loose soil, or seek refuge in and under rotting logs or fallen branches. CTS have been observed in captivity to readily burrow into loose substrate such as decomposed oak leaves (W. Cox, pers. comm.). Breeding ponds are typically vernal pools or other small, temporary waters that fill during winter rains and are dry by mid-summer. CTS can utilize artificial impoundments (farm ponds), even permanent ones, if they do not contain fish. Refer to Jennings and Hayes (1994) for a more detailed discussion of suitable habitats. Sites which contain suitable breeding locations and upland habitat (or sites with upland habitat and potential breeding locations within 1 km [0.62 mile] should be considered potential habitat. Characteristics of the site that should be recorded include topography, plant communities, presence and types of water bodies, fossorial mammal burrows, current land use, and a description of adjacent lands.

Biological Surveys

Biological surveys shall be conducted for all sites with potential habitat. Proper permits must be obtained from the DFG and FWS prior to conducting field surveys. Before nocturnal field work is conducted, the proper authorities (DFG wardens, local sheriff, etc.) must be notified. To obtain a permit, applicants must have prior experience working with CTS that demonstrates their ability to locate and identify all life stages. At least one individual with the required permit must be present to supervise or otherwise oversee field activities.

In 1994, the vernal pool tadpole shrimp (*Lepidurus packardii*), longhorn fairy shrimp (*Branchinecta longiantenna*), and Conservancy fairy shrimp (*Branchinecta conservatio*) were listed as Endangered, and the vernal pool fairy shrimp (*Branchinecta lynchi*) was listed as Threatened by the FWS (Nagano and Browning 1994). These species occupy seasonal wetlands within the range of CTS. A permit must be obtained from FWS that allows aquatic surveys for amphibians in vernal pool habitats within the range of listed crustaceans.

Nocturnal Surveys

Nocturnal surveys are used to detect CTS when they are active above ground during rainstorms. They can be observed at night, under certain conditions, before, during, and after breeding migrations, thereby providing a wide survey window.

A standard nocturnal survey requires five separate night surveys during the same weather year. All surveys must be conducted during optimal conditions or when CTS are known to be active in the region. Optimal conditions are during storm systems with 7-10°C (45-50°F) or greater air temperature when it has rained during the day and continues after dark. At least one visit must be performed during each of the months of December, January, and February. Two additional visits may occur during separate storm systems in these months or in November or March. A minimum of four person hours should be spent surveying during each visit at most study sites. Large sites may require more effort.

As a general guideline, two experienced surveyors can examine approximately 2 hectares (5 acres) of habitat in one hour, if the vegetation is not dense. Larger tracts of land containing multiple breeding locations should be sampled using randomized walk, quadrat, or transect design within 0-500 meters (0-1,640 feet) of breeding sites (Jaeger and Inger 1994, Crump and Scott 1994). The study design for large projects should be formulated in consultation with agency biologists or qualified researchers. Sampling 1-4 hectare (2.5-10 acre) plots within 0-500 meters (0-1,640 feet) of potential breeding locations is recommended.

Transects should be situated 5-15 meter (16-50 feet) apart. Transects should be walked slowly using flashlights and head-lamps to scan on either side of the transect. All mammal burrows should be inspected by looking down the tunnel as far as possible. Flagging suspected underground retreats and the perimeter of the site with reflective tape prior to the survey is helpful.

Depending on permit conditions, CTS should be sexed (see Stebbins 1985) if possible and measured (snout-vent and total length) before returning them to the exact capture location in the same direction of travel. Photographs of adult animals should be available for agency identification. Map all observations in relation to breeding locations and note apparent direction of travel. Quantify the survey effort by recording weather conditions, transect width, amount of area sampled, and person hours.

Aquatic Surveys

A standard aquatic survey requires two separate aquatic surveys during one calendar year. The first survey shall be conducted between March 15 and April 15 and the second between April 15 and May 15. There shall be at least 15 days between surveys. Surveys should not begin prior to March 15 in order to reduce disturbance to eggs and to facilitate larval identification. **Surveys for eggs should not be conducted.** Every suspected breeding location must be sampled twice during the same season if the initial visit was negative. Surveys initiated after 15 May can not be used to report negative findings because larvae may metamorphose by this time. Standard aquatic surveys must be performed at all potential breeding sites for two calendar years to support a negative finding.

CTS larvae, particularly small sizes under 35 mm (total length), are fragile and captured individuals should remain in nets only long enough to record an approximate total length measurement before being released. All other pool fauna should be treated with similar case. Sampling should cease once presence has been determined in order to minimize disturbance of pool flora and fauna.

In areas that contain numerous pools, the sampling effort should focus on pools expected to hold water for at least 10 weeks, which is approximately the minimum necessary for larvae to reach transformation (Feaver 1971). It is important to collect data regarding the type and quality of each pool sampled. At a minimum this data should include the date and time, location, type of water body (i.e. vernal pool, seasonal wetland, artificial impoundment, etc.), dimension and depth of pond, water temperature, turbidity, presence of aquatic vegetation (submergent and emergent), introduced species, and vertebrates and invertebrates present. Photographs of pools and adjacent upland areas are helpful and copies should be included in the final report.

All pools should be initially sampled using D-shaped, long-handled dipnets (typically 30 cm [12 inches] or larger), with 3 mm (1/8-inch) mesh or smaller. Most shallow ponds approximately 3 m (10 feet) in diameter or smaller can be completely sampled with dipnets. Sample approximately 50 percent of the surface area of the pond by spacing dipnet sweeps accordingly from one end of the pool to the other to sample different depths.

If fairy shrimp or tadpole shrimp are located, sampling should cease until the animals are identified to species. Return fairy shrimp immediately back to the pond. Empty nets as completely as possible before sampling different pools in proximity in order to minimize inadvertent transfer to fairy shrimp and other species. For the same reasons, nets should be thoroughly rinsed before proceeding to the next study site to ensure that pool fauna are not transferred from one region to another.

Seining can be very disruptive and this method should only be used in large pools and impoundments after dipnetting has been unsuccessful and if fairy shrimp are not present. Finemesh minnow seines of varying lengths are used to sample larger pools of different depths and sizes. They should be ordered with weights along the bottom and floats along the top edge. Attach doweling (2.4 cm by 1.5 m [1 inch by 5 feet]) or PVC pipe to the end of the seine so the bottom edge can be dragged along the bottom of the pool (Shaffer, et al. 1994; Jennings, pers. comm.) Whenever possible, pull the seine from one edge of the pond to the other (Shaffer et al. 1994). Estimate the amount of surface area sampled.

Other Survey Methods

Under certain circumstances, this protocol may be combined with other survey methods, such as pit-fall/drift fence surveys, to determine the extent of negative effects on CTS from proposed projects or to conduct more detailed scientific research. However, modifications to this protocol will only be approved on a case-by-case basis in consultation with DFG personnel.

NEGATIVE FINDINGS

In order for a suggested negative finding to be accepted, it must be supported by one or more of the following conditions or minimum survey efforts:

1. The site analysis and/or habitat analysis demonstrate that the area is not suitable for CTS, or
2. Standard aquatic surveys in two consecutive years with one standard nocturnal survey during the second year survey window all have negative results, or
3. There is no aquatic habitat on site and a standard nocturnal survey is negative.

WRITTEN REPORT

A written report should be prepared that includes the following analyses and information:

1. Site Analysis: Determine if the site is within historic range of CTS. Describe current and past land-use practices. Conduct a thorough record search in order to document the closest known breeding locality. If the parcel is found to be outside the range of the species, the report should include information in support of this determination.
2. Habitat Assessment: Provide a site description including location, size, topography, soil type, plant communities, type of water bodies, fossorial mammals detected, current land use, and information on adjacent lands. Include an assessment of the suitability of the site as upland and/or breeding habitat for CTS. Include a site map and representative photographs of upland and potential breeding habitat.
3. Nocturnal Surveys: Include date and time of each visit, weather conditions, transect spacing, area surveyed, time spent surveying, describe visibility (i.e. grass height and density, intensity of rainfall, etc.), enumerate or estimate the number of ground squirrel burrows examined (if present), map their distribution, and note presence of livestock. List all CTS measured, sexed, and photographed. Show locations of CTS on a site map.
4. Aquatic Surveys: Include the date, materials and methods used, time spent surveying, and estimate the surface area of each pond sampled. List the species of vertebrates and at least the order or family of invertebrates captured in each pool sampled.
5. Record locations of CTS, other special-status vertebrates, suspected introduced *Ambystoma* populations, and fairy shrimp on California Natural Diversity Data Base Field Survey Forms. Forms are available from the DFG (Natural Diversity Data Base, California Department of Fish and Game, 1807 Thirteenth Street, Suite 202, Sacramento, California 95814)
6. Include all required supporting information if a negative finding is being suggested.

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